

# NASA TECH BRIEF

## *John F. Kennedy Space Center*



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

### Autoignition Test Cell With Flexible Atmosphere Control

#### The problem:

Autoignition (spontaneous combustion) temperatures are usually found by simply heating a material until it bursts into flames. Though moderately sophisticated devices are occasionally used in this test, most of them cannot control parameters other than temperature e.g., pressure and the composition of the surrounding atmosphere. Furthermore, standard apparatus do not provide for chemical sampling that is helpful in determining the combustion mechanism and by-products.

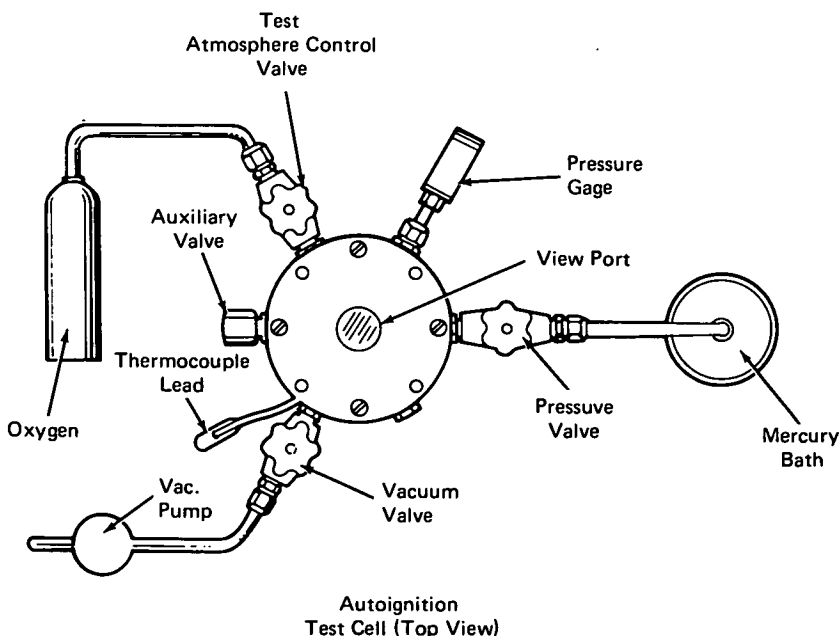
#### The solution:

A new autoignition test cell allows control of the test atmosphere and composition. This reusable device also permits periodic sampling of the decomposition products in the test atmosphere.

#### How it's done:

A top view of the test cell is shown in the figure. The test cell is a section of cylindrical pipe that is hermetically sealed on both ends, one of which has an observation window. A thermocoupled probe provides temperature readings. The pressure is regulated by a chamber-outlet bubbler-tube immersed in a mercury bath, the depth of the tube in the mercury determines the pressure in the chamber. A test gas source (oxygen in this application) is connected to the chamber, and a vacuum pump extraction system is used to remove atmosphere samples from the chamber.

To prepare the chamber for testing, the bottom chamber cover (not shown) is mounted in a holding fixture, the sample is placed in the bottom cover, and the chamber and top cover are attached. The thermocouple and pressure controlling bubbler are then placed in position.



(continued overleaf)

Before the test, the cell is evacuated and pressurized with the test atmosphere. It is then heated by immersion in constant temperature baths. As the pressure increases with temperature, gases escape through the bubbler-tube in mercury. During the test, gas samples may be taken through a rubber septum by a hypodermic syringe.

**Notes:**

1. With minor modifications, this cell could be used to determine the melting points and reactivities of a wide variety of substances.
2. Requests for further information may be directed to:  
Technology Utilization Officer  
Kennedy Space Center  
Code AD-PAT  
Kennedy Space Center, Florida 32899  
Reference: TSP73-10113

**Patent status:**

This invention has been patented by NASA (U.S. Patent No. 3,578,756). Inquiries concerning nonexclusive or exclusive license for its commercial development should be directed to:

Patent Counsel  
Kennedy Space Center  
Code AD-PAT  
Kennedy Space Center, Florida 32899

Source: Drew Evans and  
Carlos L. Springfield  
Kennedy Space Center and  
Coleman Bryan of  
Southern Research Institute  
under contract to  
Kennedy Space Center  
(KSC-10198)